









The influence of thinking styles and gender on students' creative thinking abilities in physical education

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ABSTRACT

Background: Modern developments require Generation Z to be able to face future challenges that cannot be predicted. **Research Objectives:** The purpose of this study is to investigate how thinking styles and gender can develop creative thinking skills in students when learning physical education and also to investigate the interaction between thinking style and gender on creative thinking skills. **Methods:** This study used a non-experimental design. Thinking style is measured by learning and thinking style tests (SOLAT), and creative thinking skills are measured by the Torrance Test of Creative Thinking (TTCT), which consists of four indicators: fluency, flexibility, originality, and elaboration. The sampling technique in this study was cluster random sampling. The random process is carried out in two stages: the first is random selection by randomly selecting, and the second is the second is random assignment. The sample for this research was 68, consisting of 33 men and 35 women. Meanwhile, the analysis was done by looking at n-gain and continuing with the ANOVA test. **Findings/Results:** The results of this study indicate that thinking styles and gender significantly impact students' creative thinking ability, and there is also an interaction between thinking styles and types that significantly affects students' creative thinking ability. The analysis of the data obtained found a significant relationship between gender and students' creative thinking skills in physical education. **Conclusion:** Male students have better creative thinking skills than female students because they tend to use the right brain to develop their thinking skills. In developing creative thinking skills, grouping based on gender is necessary. Future research needs to be conducted by considering the right learning model for developing creative thinking skills during physical education learning.

Keywords: Thinking style; gender; creative thinking; physical education

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INTRODUCTION

Creative thinking is important because it is the first step for someone who can think critically, enabling someone to provide new ideas, insights, and breakthroughs (Baker & Gladstone, 2022). Furthermore, Nurjan (2018) also explains that creative thinking is a mental activity to develop or find original, aesthetic, constructive ideas related to conceptual views and emphasises intellectual and rational thinking aspects. Research has

conveyed thinking styles and gender regarding creative thinking but is not consistent (Martínez-Romera, 2018). The influence of thinking style on academic achievement is a challenging topic that was raised with very different results in previous research (Ghanbari et al., 2020).

Creative thinking plays a crucial role in physical education, influencing students and teachers. Various studies emphasised the significance of developing creative thinking skills in the context of physical education (Xing & Qi, 2023). Additionally, implementing individual programmes that integrate physical and creative development has been proven to impact students' creative thinking levels positively (Botagariyev et al., 2023). Research has conveyed thinking styles and gender regarding creative thinking but is not consistent (Handayani & Koeswanti, 2021; Phillips et al., 2016). Other studies found that male and female students have different perspectives on the way teachers teach in class because their ways of thinking and learning are different. This is one of the reasons why many male students do not continue school (drop out) because the female teacher's teaching style is different from the way male students think (Baker & Gladstone, 2022). In school, women have better creative thinking skills than male students (Sokić et al., 2021). More research is needed to prove differences in thinking skills between male and female students (de Cássia Nakano et al., 2021).

Research on creative thinking is not well represented in the literature, and the results of mixed studies are often hard to draw conclusions from, so further research is still needed on this (Lim, 2014). Creative thinking skills are important for problem-solving, thinking ability, social and emotional well-being, and success. However, research on creative thinking skills is not as convincing as we would like. This may be because there are still many studies that rule out stereotypes about creative thinking skills (Tong et al., 2020). It is worth noting that the child will be able to develop his creative thinking skills in their own way, and that is part of the process (Ayyildiz & Yilmaz, 2021).

A physical education programme positively influences creative thinking. Research by Mkpanang (2016) reveals that creative style accounts for 23%, while the combined influence of creative style and gender accounts for 52% of creative thinking. Past research has also found creative thinking skills, gender, education, and thinking abilities. From existing research, incidents or differences in results are still found, such as female students having better creative thinking skills than male students (Chia et al., 2008). In contrast, other researchers report that men are more creative than women (Nada & Sari, 2022). Here, it can be seen that there is still inconsistency in research on thinking styles and gender towards creative thinking, so further research needs to be carried out.

The purpose of this study is to investigate how thinking styles and gender can develop creative thinking skills in students when learning physical education. Various predicted studies of students' creative thinking based on Sternberg's thinking style among high school students found that there was a significant relationship between thinking style and creativity but no significant difference in creativity between boys and girls (Martínez-Romera, 2018; Aziz, 2023). Botagariyev et al. (2023) conduct research through physical education programmes to improve students' creative thinking. These studies can be used to further investigate the development of students' bodies and minds. Dupri et al. (2021) mentioned that research on creative thinking skills in physical education needs further research involving other variables such as gender, thinking style, age, and school level. The results of previous studies have not been consistent; therefore, this research was carried out to find new results regarding gender creative thinking skills and thinking styles because other research found that ethnicity, academic major, and critical thinking

have a significant relationship between creative thinking skills and thinking style (Arumningsih et al., 2023; Chua, 2016; Phillips et al., 2016).

METHOD

Type of Research

This study used a non-experimental design; it does not apply treatment to this research sample; only tests are carried out to see creative thinking skills by grouping by gender.

Participants

The participants of this study were children ages 12–14 who are students in the region. The sampling technique used in this study is cluster random sampling. The random process was carried out in two stages. The first was random selection by randomly selecting the selected class level of class X, which is listed from 7 classes, and then random assignment was carried out to select two classes that were used as a sample for this research, so that the sample in this study amounted to 68 people from a population of 623 students in senior high school, which consisted of 33 males and 35 females.

Instrument

This research uses two tests: the modified Torrance Tests of Creative Thinking (Torrance, 2018), which measures students' creative thinking abilities, and the Styles of Learning and Thinking test (Torrance, 1972), which measures students' thinking styles.

Research Procedures

Students voluntarily answered the test used when physical education learning took place. The time allocation for answering the test is 20 and 45 minutes, respectively. (1) The Styles of Learning and Thinking Test (SOLAT), which consists of 28 multiple-choice questions. Used to determine the brain's thinking style the respondent's tendency to think and learn with either the left brain, right brain, or whole brain. (2) Torrance Tests of Creative Thinking in the form of a questionnaire consisting of 38 statement items. Used to determine respondents' creative thinking abilities in five aspects: originality, fluency, elaboration, abstractness, and resilience. The instrument used for data collection has been tested for validity and reliability. Therefore, the test was reliable for collecting data from the research subjects.

Data Analysis

To analyse the data, this study first looked at the N-gain results to see the effect of gender on creative thinking skills and thinking styles. Next, an ANOVA test was carried out to prove the significant influence and interaction of gender and thinking style on students' creative thinking skills.

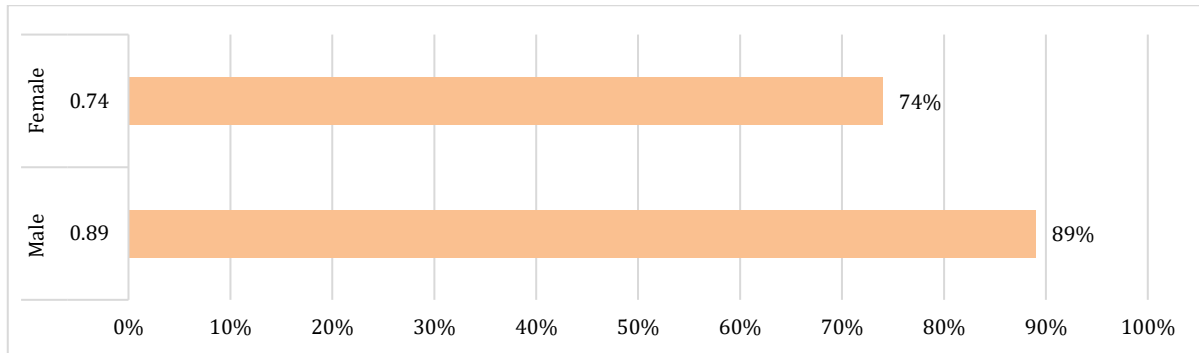
RESULTS AND DISCUSSION

The first analysis carried out is to look at the n gain of the two variables, as shown in the table below:

Table 1. Average N Gain of Creative Thinking Ability and Gender

	Gender	Mean N Gain	Percentage	Sig.
Creative Thinking	Male	0.89	89%	0.000
	Female	0.74	74%	

From Table 1 above, it can be seen that the mean N-gain for creative thinking in men is 0.89. Where this score indicates that it is in the high category, this proves that male students have better creative thinking skills than female students. While students have an average score of 0.74, including in the medium category, this also proves that female students also have creative thinking skills when learning physical education, even though they are lower than men. Furthermore, on the average N-gain effectiveness interpretation category based on the average percentage, the result is shown below:



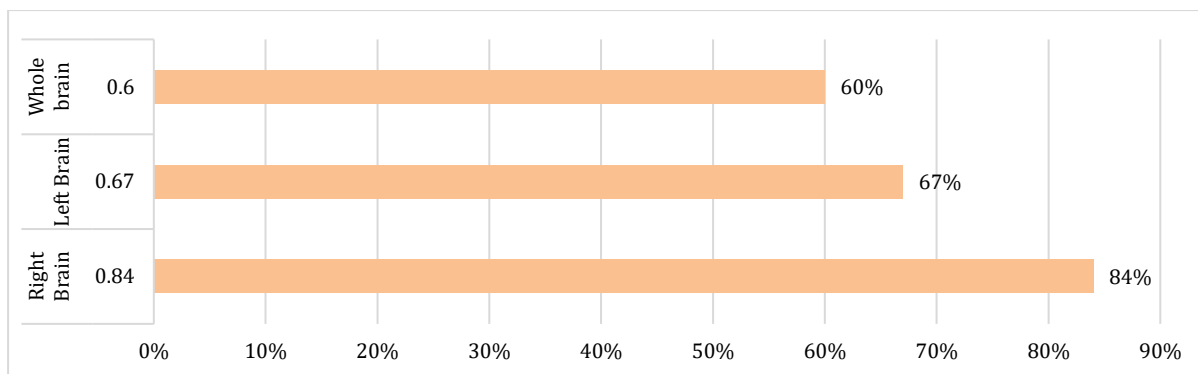
Graph 1. Percentage Effectiveness By Gender

It can be seen that the percentage of men is higher than women, which is 89%, which is included in the effective interpretation category. Meanwhile, the average percentage of N-gain in women is 74%, which is included in the quite effective interpretation category. The analysis test results from the data obtained found that there were significant differences in creative thinking abilities between male and female students.

Table 2. Average N Gain of Creative Thinking Ability and Thinking Style

	Thinking Style	Mean N Gain	Percentage	Sig.
Creative Thinking	Right Brain	0.84	84%	0.000
	Left Brain	0.67	67%	
	Whole brain	0.60	60%	

From Table 2 above, it can be seen that students who use the right brain are more dominant in their creative thinking skills than those who use the left brain. The average of those who use the right brain is 0.84, which is included in the high effectiveness category, while those who use the left brain are included in the medium effectiveness category, and those who use the middle brain have an average of 0.60, which is included in the medium effectiveness category. From Table 2 above, it can be seen that students who use the right brain are more dominant in their creative thinking skills than those who use the left brain. The average of those who use the right brain is 0.84, which is included in the high effectiveness category, while those who use the left brain are included in the medium effectiveness category, and those who use the middle brain have an average of 0.60, which is included in the medium effectiveness category.



Graph 2. Percentage Effectiveness By Thinking Style

It can be seen that the percentage of people who use the right brain is 84%, which is included in the effective interpretation category. Meanwhile, in the left brain, the average percentage of n gain is 67%, which is included in the quite effective interpretation category. and there are significant differences between male and female students regarding students' creative thinking abilities.

Table 3. ANOVA Gender and Thinking Style

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.899 ^a	3	.300	11.863	.000
Intercept	31.353	1	31.353	1236.066	.000
Thinking Styles	.595	1	.595	23.561	.000
Gender	.186	1	.186	7.363	.000
Thinking Styles * Gender	.134	1	.134	4.431	.000
Error	1.616	64	.025		
Total	33.755	68			
Corrected Total	2.515	67			

From the ANOVA test table above, it can be seen that thinking style has a significant influence with a sig value of $0.000 < \alpha = 0.05$, as well as gender with a sig value of $0.000 < \alpha = 0.05$, which proves that gender also has a significant influence on creative thinking skills. Furthermore, it can be seen in the next row in the table above that the joint influence between thinking style and gender on creative thinking skills also has a sig value of $0.000 < \alpha = 0.05$.

The results of this study are in line with what was conveyed at the beginning and will be an important part of the physical education research journey, especially in developing creative thinking skills by paying attention to gender. Where it is also supported by other research, it can be concluded that gender in this research has an impact on students' creative thinking skills, starting from the components of originality, fluency, elaboration, abstractness, and resilience (Wang, 2019). Several researchers found that women are more creative than men (Anggorowati et al., 2024). In contrast, other researchers report that men do this more creatively than women (Chiu et al., 2019). Teng (2022) found that a teacher's teaching style greatly influences the different learning and thinking styles of students, especially students' genders who have different thinking and learning styles. Zhang (2020) stated that female teachers' teaching style, which differs from male students' thinking and learning styles, is one of the reasons why many male students drop out of school. This may explain the differences in thinking abilities between male and female students.

Differences in creative thinking were found between different age groups using functional magnetic resonance imaging while participants performed different thinking tasks (Adnan et al., 2019). This proves that the process of developing creative thinking skills are influenced by age, where the creative thinking process of older people is better than that of younger people. Although age is known to influence creativity, there are differences in creativity between individuals of the same age (Restrepo et al., 2019; Ross et al., 2023). This fact supports the idea that high creative ability may be related to other factors that influence cognitive function. The results of the research (Ross et al., 2023) also found the same thing: creative thinking skills have a significant difference with students' thinking styles in physical education.

The physical education classroom is influenced by traditional education, making it difficult to predict future events. This can only be accomplished through hard work, perseverance, exploration, sacrifice, and long-term employment (Wang, 2019). Physical education teachers must be able to teach not only as teachers but also as friends by allowing students to speak freely, actively ask difficult questions, and provide more possible solutions. Teachers must encourage students to form valid opinions, dare to bring out the ability to explore, create, and cultivate their creative thinking (Zhang, 2020).

The findings about thinking styles in physical education are the latest findings in the world of physical education in developing students' creative thinking skills (Lyra et al., 2017). Further research needs to be carried out to strengthen future results showing that physical education can develop students' creative thinking skills. The lack of treatment in this study is a limitation that needs to be addressed further, such as by using a learning model that supports the development of creative thinking (Dupri, et al., 2021). In addition to gender (Shubina & Kulakli, 2019), the age level of the sample also needs to be considered in the future because the level of thinking ability at age has a significant difference (Zhang, 2020).

CONCLUSION

Based on the findings, this study concludes that men possess superior creative thinking skills compared to women. In addition, students who use the right brain for thinking have higher creative thinking skills. The analysis also shows that the interaction between thinking style and gender in physical education improves critical thinking skills. One limitation of this study is the lack of special treatment to foster students' creative thinking skills during physical education learning. This should be taken into account in further research. We need to conduct further research with supportive treatments and sufficient time to develop creative thinking skills. Moreover, additional research can delve deeper into the application of the interplay between thinking styles and gender in diverse learning environments. This research provides a deeper understanding of gender differences in creative thinking skills and how certain thinking styles can influence these outcomes. It also demonstrates the importance of considering the interaction between thinking styles and gender in physical education contexts to improve critical thinking skills. In addition, this study highlights the need for specific interventions designed to develop students' creative thinking skills during physical education learning.

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CONFLICT OF INTEREST

The author declared that there was no conflict of interest in writing this article.

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